IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/707,657
Appellant	:	James Kenneth Aragones et al.
Filed	:	December 30, 2003
Title	:	SYSTEM AND METHOD FOR MEASURING QUALITY OF BASELINE MODELING TECHNIQUES
TC/A.U.	:	2123
Confirmation No .	:	1656
Examiner	:	Craig, Dwin M
Docket No.	:	RD 28217-2

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APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal submitted on September 10, 2007.

The Commissioner is authorized to charge the requisite fee of $510.00, and any additional fees, which may be necessary to advance prosecution of the present application, to Account No. 07-0868.

1. REAL PARTY IN INTEREST

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by James Kenneth Aragones and Jeffrey William Stein. Accordingly, General Electric Company will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellant's legal representative in this Appeal.

3. STATUS OF CLAIMS

Claims 1-24 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal.

4. STATUS OF AMENDMENTS

On July 17, 2007, Appellant submitted an amendment under 37 CFR 1.116. In the Advisory Action dated August 3, 2007, the Examiner indicated that the Amendment dated July 17, 2007 would be entered for the purpose of the Appeal because the claim language is further clarified by the amendment. The claims presented in Section 9, Appendix of Claims on Appeal include the July 17, 2007 amendments to the claims.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to systems and methods for quantifying baseline model quality. See, Application page 11, paragraph 35, continuing to page 12. More particularly, the invention relates to systems and methods for quantifying baseline model quality that evaluate the performance of an engine baseline model. See, Application page 12, paragraph 38, continuing to page 13.

The Application contains six pending independent claims, 1, 5, 9, 13, 17 and 21. Claims 1 and 5 are directed to a system for quantifying baseline model quality. Claims 9 and 13 are

directed to a method for quantifying baseline model quality. Claims 17 and 21 are directed to a computer-readable medium storing computer instructions for instructing a computer system to quantify baseline model quality. The subject matter of each of these independent claims is summarized below.

Discussions of the recited features of Claims 1, 5, 9, 13, 17 and 21 can be found in at least the following cited locations of the specification. By way of example, Figure 1 shows a schematic diagram of a general-purpose computer system in which a system for performing engine baseline modeling operates. Figure 2 shows a top-level component architecture diagram of an engine baseline modeling system 28 that operates on the computer system 10 shown in Figure 1. Figure 5 shows a flow chart illustrating one embodiment of a method for determining the quality of a baseline model. Claim 1 is directed to a system 28 for quantifying baseline model quality comprising an engine service database 30 containing engine data. (See, Application, page 6, paragraphs 16 and 17.) The system 28 further comprises a preprocessor 32 for processing the engine data into a predetermined format. (See, Application, page 8, paragraph 20.) The system 28 further comprises an engine baseline modeling component 34 that builds an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 9, paragraph 23.)

The system 28 further comprises a model diagnostics component 36 that evaluates the performance of the engine baseline model. (See, Application, page 12, paragraph 38.) The model diagnostics component 36 includes means for comparing engine data from a plurality of engines against the engine baseline model. (See, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, block 88.) The model diagnostics component 36 further includes means for generating engine trends for each of the plurality of engines. (See, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, block 90.) The model diagnostics component 36 further includes means for identifying correlations between the engine trends and various parameters. (See, Application, page 18, paragraph 50; and Figure 5, block 92.) The model diagnostics component 36 further includes means for calculating, for each identified correlation, summary statistics relating to the degree of correlation. (See, Application, page 18,

paragraph 51; and Figure 5, block 94.) The model diagnostics component 36 is configured to use the summary statistics to evaluate the performance of the engine baseline model. (See, Application, page 18, paragraph 51, continuing to page 19.) The system 28 is configured to use the engine baseline model to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

The algorithms performed by the components in the engine baseline modeling system 28 (i.e., the preprocessor 32, engine baseline modeling component 34 and model diagnostics component 36 can be programmed with a commercially available statistical package such as SAS, but other languages such as C or Java may also be used. (See, Application, page 13, paragraph 39.) The engine baseline modeling system 28 is not limited to a software implementation. For instance, the preprocessor 32, engine baseline modeling component 34 and model diagnostics component 36 may take the form of hardware or firmware or combinations of software, hardware, and firmware. In addition, the engine baseline modeling system 28 is not limited to the preprocessor 32, engine baseline modeling component 34 and model diagnostics component 36. (See, Application, page 13, paragraph 40.)

Claim 5 is directed to a system 28 for quantifying baseline model quality. By way of example, Figure 6 shows another embodiment of a method for evaluating a baseline model. The system 28 comprises an engine service database 30 containing engine data. (See, Application, page 6, paragraphs 16 and 17.) The system 28 further comprises a preprocessor 32 for processing the engine data into a predetermined format. (See, Application, page 8, paragraph 20.) The system 28 further comprises an engine baseline modeling component 34 that builds an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 9, paragraph 23.) The system 28 further comprises a model diagnostics component 36 that evaluates the performance of the engine baseline model. (See, Application, page 12, paragraph 38.)

The model diagnostics component 36 includes means for evaluating, a subset of the engines used to create the model in time order against the generated baseline. (See, Application, page 19, paragraph 52; and Figure 6, block 98.) The model diagnostics component 36 further includes means for generating time-varying system trends. (See, Application, page 19, paragraph 52; and Figure 6, block 100.) The model diagnostics component 36 further includes means for plotting data points representative of the time-varying system trends over time. (See, Application, page 19, paragraph 53; and Figure 6, block 102.) The model diagnostics component 36 further includes means for fitting a smoothed curve to the plotted data points. (See, Application, page 19, paragraph 53; and Figure 6, block 104.) The model diagnostics component 36 further includes means for computing residual errors for each point. (See, Application, page 19, paragraph 53; and Figure 6, block 106.) The model diagnostics component 36 is configured to use the residual errors to evaluate the performance of the engine baseline model. (See, Application, page 19, paragraph 54.) The system 28 is configured to use the engine baseline model to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

Claim 9 is directed to a method for quantifying baseline model quality. By way of background, Figure 3 shows a flow chart describing actions performed by the engine baseline modeling system 28, and Figure 5 shows a flow chart illustrating one embodiment of a method for determining the quality of a baseline model. The method comprises storing engine data in an engine service database 30. (See, Application, page 6, paragraph 17.) The method further comprises processing the engine data into a predetermined format (see, Application, page 13, paragraph 41), and building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 14, paragraph, 42.) The method further comprises evaluating performance of the engine baseline model. (See, Application, page 14, paragraph, 44, continuing to page 15.) Evaluating the performance of the engine baseline model comprises comparing engine data from a plurality of engines against the engine baseline model (see, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, block 88), generating

engine trends for each of the plurality of engines (see, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, block 90), identifying correlations between the engine trends and various parameters (see, Application, page 18, paragraph 50; and Figure 5, block 92), and calculating, for each identified correlation, summary statistics relating to the degree of correlation. (See, Application, page 18, paragraph, 51; and Figure 5, block 94.) The method further comprises using the summary statistics to evaluate the performance of the engine baseline model (see, Application, page 18, paragraph 51). The engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

Claim 13 is directed to a method for quantifying baseline model quality. By way of background, Figure 3 shows a flow chart describing actions performed by the engine baseline modeling system 28, and Figure 6 shows an embodiment of a method for evaluating a baseline model. The method comprises storing engine data in an engine service database 30. (See, Application, page 6, paragraph 17.) The method further comprises processing the engine data into a predetermined format (see, Application, page 13, paragraph 41), and building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 14, paragraph, 42.) The method further comprises evaluating performance of the engine baseline model (see, Application, page 14, paragraph, 44, continuing to page 15), evaluating the performance of the engine baseline model comprises evaluating a subset of the engines used to create the model in time order against the generated baseline (see, Application, page 19, paragraph 52; and Figure 6, block 98), generating time-varying system trends (see, Application, page 19, paragraph 52; and Figure 6, block 100), plotting data points representative of the time-varying system trends over time (see, Application, page 19, paragraph 53; and Figure 6, block 102), fitting a smoothed curve to the plotted data points (see, Application, page 19, paragraph 53; and Figure 6, block 104), and computing residual errors for each point. (See, Application, page 19, paragraph 53; and Figure 6, block 106.) The method further comprises using the residual errors to evaluate the performance of the engine baseline model. (See, Application, page 19,

paragraph 54.) The engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

Claim 17 is directed to a computer-readable medium storing computer instructions for instructing a computer system 10 to quantify baseline model quality. By way of background, Figure 1 shows a schematic diagram of a general-purpose computer system in which a system for performing engine baseline modeling operates the computer instructions. The computer readable medium comprises one or more instructions for storing engine data in an engine service database 30. (See, Application, page 6, paragraph 17, continuing to page 7, paragraph 18; and page 15, paragraph 45, continuing to page 16, paragraph 46.) The computer readable medium further comprises one or more instructions for processing the engine data into a predetermined format. (See, Application, page 8, paragraphs 20 and 21.) The computer readable medium further comprises one or more instructions for building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 9, paragraph 23.) The computer readable medium further comprises one or more instructions for evaluating performance of the engine baseline model, wherein evaluating the performance of the engine baseline model comprises one or more instructions for comparing engine data from a plurality of engines against the engine baseline model (see, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, Block 88), one or more instructions for generating engine trends for each of the plurality of engines (see, Application, page 17, paragraph 49, continuing to page 18; and Figure 5, Block 90), one or more instructions for identifying correlations between the engine trends and various parameters (see, Application, page 18, paragraph 50; and Figure 5, Block 92), one or more instructions for calculating, for each identified correlation, summary statistics relating to the degree of correlation (see, Application, page 18, paragraph 51; and Figure 5, Block 94), and one or more instructions for using the summary statistics to evaluate the performance of the engine baseline model. (See, Application, page 18, paragraph 51, continuing to page 19.) The engine baseline model is used to perform at least one of monitoring engine status, predicting future

engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

Claim 21 is directed to a computer-readable medium storing computer instructions for instructing a computer system 10 to quantify baseline model quality. The computer-readable medium comprises one or more instructions for storing engine data in an engine service database. (See, Application, page 6, paragraph 17, continuing to page 7, paragraph 18.) The computer-readable medium further comprises one or more instructions for processing the engine data into a predetermined format. (See, Application, page 8, paragraphs 20 and 21.) The computer-readable medium further comprises one or more instructions for building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions. (See, Application, page 9, paragraph 23.) The computer-readable medium further comprises one or more instructions for evaluating performance of the engine baseline model, wherein evaluating the performance of the engine baseline model comprises one or more instructions for evaluating a subset of the engines used to create the model in time order against the generated baseline (see, Application, page 19, paragraph 52; and Figure 6, block 98), one or more instructions for generating time-varying system trends (see, Application, page 19, paragraph 52; and Figure 6, block 100), one or more instructions for plotting data points representative of the time-varying system trends over time (see, Application, page 19, paragraph 53; and Figure 6, block 102), one or more instructions for fitting a smoothed curve to the plotted data points (see, Application, page 19, paragraph 53; and Figure 6, block 104), one or more instructions for computing residual errors for each point (see, Application, page 19, paragraph 53; and Figure 6, block 106), and one or more instructions for using the residual errors to evaluate the performance of the engine baseline model. (See, Application, page 19, paragraph 54.) The engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems. (See, Application, page 6, paragraph 16.)

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellant respectfully urges the Board to review and reverse the Examiner's first ground of rejection in which Claims 1-24 are rejected under 35 USC 103(a) over US Patent No. 5,018,069 (Pettigrew), in view of US Patent No. 5,727,128 (Morrison).

7. ARGUMENT

As discussed in detail below, Claims 1-24 define allowable subject matter over the cited art. Accordingly, Appellant respectfully requests full and favorable consideration by the Board.

A. Ground of Rejection No. 1:

The Examiner rejected Claims 1-24 under 35 U.S.C. 103 (a) over US Patent No. 5,018,069 (Pettigrew), in view of US Patent No. 5,727,128 (Morrison).

1. Legal basis required to establish a *prima facie* case of obviousness.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes all of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).

2. <u>Claims 1-24 define allowable subject matter over Pettigrew, in view of Morrison.</u>

Specifically, and as recited in independent Claims 1 and 5, Appellant respectfully submits that the cited references do not teach or disclose at least a system for *quantifying baseline model quality* comprising a model diagnostics component that *evaluates the performance of an engine baseline model.* In addition, and as recited in independent claim 1, Appellant respectfully submits that the cited references do not teach or disclose a system that includes a model diagnostics component with means for calculating, for each identified correlation, summary statistics relating to the degree of correlation, *wherein the model diagnostics component is further configured to use the summary statistics to evaluate the performance of the engine baseline model.* Further, and as recited in independent claim 5, Appellant respectfully submits that the cited references do not teach or disclose a system that includes a model diagnostics component that computes residual errors for each point, *wherein the model diagnostics component is further configured to use the residual errors to evaluate the performance of the engine baseline model.*

Similarly, and as recited in independent Claims 9 and 13, Appellant respectfully submits that the cited references do not teach or disclose at least a method for *quantifying baseline model quality* comprising *evaluating performance of the engine baseline model.* In addition, and as recited in independent claim 9, Appellant respectfully submits that the cited references do not teach or disclose a method that includes calculating, for each identified correlation, summary statistics relating to the degree of correlation, wherein the method further includes *using the summary statistics to evaluate the performance of the engine baseline model.* Further, and as recited in independent claim 13, Appellant respectfully submits that the cited references do not teach or disclose a method that includes computing residual errors for each point, and *using the residual errors to evaluate the performance of the engine baseline model.*

Similarly, and as recited in independent Claims 17 and 21, Appellant respectfully submits that the cited references do not teach or disclose at least a computer-readable medium storing computer instructions for instructing a computer system to *quantify baseline model quality* comprising one or more instructions for *evaluating performance of an engine baseline model.*

In addition, and as recited in independent claim17, Appellant respectfully submits that the cited references do not teach or disclose a computer-readable medium storing computer instructions, where the computer instructions comprise one or more instructions for calculating, for each identified correlation, summary statistics relating to the degree of correlation, and *one or more instructions for using the summary statistics to evaluate the performance of the engine baseline model.* Further, and as recited in independent claim 21, Appellant respectfully submits that the cited references do not teach or disclose a computer-readable medium storing computer instructions, where the computer instructions comprise one or more instructions for computing residual errors for each point, and *one or more instructions for using the residual errors to evaluate the performance of the engine baseline model.*

The present patent application discloses a system and method for *quantifying baseline model quality* and *evaluating the performance of an engine baseline model* by analyzing generated engine trends for the presence of correlations to various engine, aircraft, or environmental parameters. See, e.g., Application, paragraph [0050], lines 6-7 on page 18. Specifically, and in one embodiment, the quality of the generated baseline model is determined by identifying correlations between engine trends and various parameters, and for each identified correlation, summary statistics relating to the degree of correlation are calculated, wherein the summary statistics of the correlations are used to evaluate the relative goodness of the generated baseline models. See, e.g., Application, paragraph [0051], lines 15-16 on page 18 and paragraph [0051], lines 1-2, on page 19. Further, and in another embodiment, data points representative of engine trends are generated and plotted over time. Residual errors computed for each trend point are used to evaluate the performance of the engine baseline model. See, e.g., Application, paragraphs [0053] and [0054].

In contrast, Pettigrew is directed to a reference system and method for diagnosing engine conditions. Contrary to the Examiner's assertions, Pettigrew does not teach or suggest a model diagnostics component that evaluates the performance of an engine baseline model. Rather, the cited portion of Pettigrew (Col. 2, lines 19-46), discloses that engine behavior can be recorded in a referred engine diagnostic data (REDD) format and that a turbine engine may be diagnosed based on a logical analysis of the functional dependency between normal system operation and

actual sensed engine performance parameters. This cited portion has no relation whatsoever to *evaluating the performance of an* engine baseline *model.* In fact, Appellant submits that Pettigrew does not teach or suggest a *model* diagnostics component. Instead, the diagnostic means in Pettigrew are for diagnosing a turbine engine (Pettigrew, Col. 2, lines 29-30) in order to indicate the extent of performance degradation in the turbine engine being monitored (Pettigrew, Col. 3, lines 6-13).

Appellant respectfully disagrees with the Examiner's assertion that Figure 5, element 250, and Col. 11, lines 39-56 "clearly teaches a predictive model being evaluated as regards performance against the current data and projected data." (See, June 11, 2007 Final Office Action, page 6, lines 2-5.) Figure 5 is directed to operational use of REDD. Element 250 is labeled "TREND REDD AND TEAC REDD." The acronym TEAK stands for turbine engine analysis check. (See, Pettigrew, Col. 10, line 33.) As shown in Figure 5, the output of 250 is element 244 entitled "FLY OR FIX DECISION WITH RISK." Nowhere in Figure 5 is there a suggestion that a predictive model be evaluated. Instead, *Pettigrew evaluates the actual engine performance data* by comparison against Normal Band (element 232 in Figure 5). Turning to the text cited by the Examiner, the cited portion, Col. 11, lines 39-56, is copied below.

> If the decision is made to "fly" despite the REDD values exceeding the normal operating baselines, the intervals between data collection may be reduced as a precautionary measure 248 and the decision to continue flying may be periodically reevaluated 250 in light of the trends of the deviation of the REDD values from the baseline over time. If the decision at 244 is made to "fix", the engine is disassembled and inspected to determine and repair the abnormality. The probable cause of engine deterioration may be identified by comparing the out-of-limit REDD values and their direction of deviation (HI or LO) with the diagnostic chart in Table 1 at step 251. Records of bad calls should be kept at step 252 and the preliminary normal operating band of "three times the standard deviation" may be adjusted at step 254, as necessary, to coordinate the actual condition of the problem engine with the normal operating band for the diagnosis.

Appellant respectfully submits that this cited portion does not teach or suggest *evaluating the performance of a baseline model* but rather teaches comparing the trends of the deviation of the REDD values with a baseline in order to periodically reevaluate the decision to continue flying.

Further, Appellant respectfully disagrees with the Examiner's comments in the Advisory Action dated August 3, 2007 that "when the engine data in Pettigrew is compared to the baseline model, *the data itself is a model* and because it is compared to the baseline, the model itself is being validated or qualified." *The engine data in Pettigrew is not a baseline model.* It is engine data and is being compared with normal operating baselines in order to determine whether to (a) disassemble and inspect to determine and repair the abnormality or (b) whether to continue flying the engine. This is a clear and distinct difference from the present invention.

The Examiner cites Morrison to supply teachings regarding data processing and statistical techniques. Morrison is directed to a system and method for automatically determining a set of variables for use in creating a process model and does not supply the above-discussed deficiencies of Pettigrew.

In addition, Appellant respectfully submits that the claim recitation "wherein the model diagnostics component is configured to use the summary statistics to evaluate the performance of the engine baseline model" should be given patentable weight. In regard to the Examiner's comments and citation of the MPEP section 2111.4 (see, Final Office Action, page 6, line 17, continuing to page 7, line 4), Appellant respectfully submits that the claim recitation "*wherein the model diagnostics component is configured to use the summary statistics to evaluate the performance of the engine baseline model*" is not a mere expression of the intended result of a process step. On the contrary, this recitation is an integral part of the claimed invention. The Examiner cites MPEP 2111.4 to support his position. MPEP 2111.4 cites two recent cases from the Court of Appeals for the Federal Circuit (CAFC), *Menton v. NASDQ, Inc.*, 336 F.3d 1373 (Fed. Cir. 2003) and *Hoffer v. Microsoft Corp.*, F.3d 1326,1329, 74 USPQ2d 1481 (Fed. Cir. 2005).

Appellant respectfully submits that the claim recitation at issue here is qualitatively similar to that at issue in *Hoffer,* and further that the whereby clause at issue in *Menton* was

qualitatively different from the claim recitation at issue here. In *Hoffer*, the court affirmed the construction of the following whereby clause:

> whereby a trade network supports users at said plurality of RUTs, who are each guided by said IAPI to select an economic activity, to identify that index topic that corresponds to said activity, to enter that topic board dedicated to said topic, and who are collectively able to concurrently engage in interactive data messaging on said topic boards

by the district court to require interactive data messaging. In so doing, the court noted that "[t]his capability is more than the intended result of a process step; it is part of the process step itself." In contrast in *Menton*, the court affirmed the district court's construction of the whereby clause "whereby the security is traded efficiently between the first individual and the second individual" "as merely expressing the intended result of a processing step positively recited." As such, the court did not give weight to the "trading efficiently" phrase.

In view of the similarity of the present claim recitation at issue with the whereby clause in *Hoffer*, Appellant respectfully submits that the claim recitation "the model diagnostics component is configured to use the summary statistics to evaluate the performance of the engine baseline model" should be given patentable weight. Further, Appellant respectfully submits that this recitation is not taught by the cited art.

As such, Appellant respectfully submits that the cited art does not teach or suggest all of the claim limitations of Claims 1, 5, 9, 13, 17 and 21. Accordingly, a *prima facie* case of obviousness has not been established for Claims 1, 5, 9, 13, 17 and 21. Dependent claims 2-4, 6-8, 10-12, 14-16, 18-20 and 22-24 depend from presumably allowable independent claims 1, 5, 9, 13, 17 and 21. Accordingly, these claims are believed to be clearly patentable over the cited combination. In view of the above, Appellant requests that the Board overturn the rejections and allow Claim 1-24.

8. Conclusion

Appellant respectfully submits that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned legal representative at the telephone number indicated below.

Respectfully submitted,

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9. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

1. A system for quantifying baseline model quality, comprising:

an engine service database containing engine data;

a preprocessor for processing the engine data into a predetermined format;

an engine baseline modeling component that builds an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions; and

a model diagnostics component that evaluates the performance of the engine baseline model, wherein the model diagnostics component includes:

means for comparing engine data from a plurality of engines against the engine baseline model;

means for generating engine trends for each of the plurality of engines;

means for identifying correlations between the engine trends and various parameters; and

means for calculating, for each identified correlation, summary statistics relating to the degree of correlation, wherein the model diagnostics component is configured to use the summary statistics to evaluate the performance of the engine baseline model, and wherein the system is configured to use the engine baseline model to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

2. The system of claim 1, wherein the means for identifying correlations between engine trends and various parameters further generate correlation coefficients for each identified correlation.

3. The system of claim 1, wherein the summary statistics include at least one of a standard deviation, a mean, or a histogram for each identified correlation.

4. The system of claim 3, wherein a good model is best represented by summary statistics tending toward zero.

5. A system for quantifying baseline model quality, comprising:

an engine service database containing engine data;

a preprocessor for processing the engine data into a predetermined format;

an engine baseline modeling component that builds an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions; and

a model diagnostics component that evaluates the performance of the engine baseline model, wherein the model diagnostics component includes:

means for evaluating, a subset of the engines used to create the model in time order against the generated baseline;

means for generating time-varying system trends;

means for plotting data points representative of the time-varying system trends over time;

means for fitting a smoothed curve to the plotted data points; and

means for computing residual errors for each point, wherein the model diagnostics component is configured to use the residual errors to evaluate the performance of the engine baseline model, and wherein the system is configured to use the engine baseline model to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

6. The system of claim 5, wherein residual errors computed reflect the amount by which each trend point varies from the smoothed curve.

7. The system of claim 5, wherein the model diagnostics component further comprises:

means for estimating a sigma value by performing a root mean squared error calculation; and

means for generating summary statistics using the estimated sigma values.

8. The system of claim 7, wherein a good model is best represented by lower estimated sigma values.

9. A method for quantifying baseline model quality, comprising:

storing engine data in an engine service database;

processing the engine data into a predetermined format;

building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions;

evaluating performance of the engine baseline model ,wherein evaluating the performance of the engine baseline model comprises:

comparing engine data from a plurality of engines against the engine baseline model;

generating engine trends for each of the plurality of engines;

identifying correlations between the engine trends and various parameters; and

calculating, for each identified correlation, summary statistics relating to the degree of correlation;

wherein the method further comprises using the summary statistics to evaluate the performance of the engine baseline model, and wherein the engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

10. The method of claim 9, wherein identifying correlations between engine trends and various parameters further comprises generating correlation coefficients for each identified correlation.

11. The method of claim 9, wherein the summary statistics include at least one of a standard deviation, a mean, or a histogram for each identified correlation.

12. The method of claim 11, wherein a good model is best represented by summary statistics tending toward zero.

13. A method for quantifying baseline model quality, comprising:

storing engine data in an engine service database;

processing the engine data into a predetermined format;

building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions;

evaluating performance of the engine baseline model, wherein evaluating the performance of the engine baseline model comprises:

evaluating a subset of the engines used to create the model in time order against the generated baseline;

generating time-varying system trends;

plotting data points representative of the time-varying system trends over time;

fitting a smoothed curve to the plotted data points; and

computing residual errors for each point;

wherein the method further comprises using the residual errors to evaluate the performance of the engine baseline model, and wherein the engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

14. The method of claim 13, wherein residual errors computed reflect the amount by which each trend point varies from the smoothed curve.

15. The method of claim 13, further comprising:

estimating a sigma value by performing a root mean squared error calculation; and

generating summary statistics using the estimated sigma values.

16. The method of claim 15, wherein a good model is best represented by lower estimated sigma values.

17. A computer-readable medium storing computer instructions for instructing a computer system to quantify baseline model quality, the computer instructions comprising:

one or more instructions for storing engine data in an engine service database;

one or more instructions for processing the engine data into a predetermined format;

one or more instructions for building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions;

one or more instructions for evaluating performance of the engine baseline model, wherein evaluating the performance of the engine baseline model comprises:

one or more instructions for comparing engine data from a plurality of engines against the engine baseline model;

one or more instructions for generating engine trends for each of the plurality of engines;

one or more instructions for identifying correlations between the engine trends and various parameters;

one or more instructions for calculating, for each identified correlation, summary statistics relating to the degree of correlation; and

one or more instructions for using the summary statistics to evaluate the performance of the engine baseline model, wherein the engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

18. The computer-readable medium of claim 17, wherein the one or more instructions for identifying correlations between engine trends and various parameters further comprise one or more instructions for generating correlation coefficients for each identified correlation.

19. The computer-readable medium of claim 17, wherein the summary statistics include at least one of a standard deviation, a mean, or a histogram for each identified correlation.

20. The computer-readable medium of claim 19, wherein a good model is best represented by summary statistics tending toward zero.

21. A computer-readable medium storing computer instructions for instructing a computer system to quantify baseline model quality, the computer instructions comprising:

one or more instructions for storing engine data in an engine service database;

one or more instructions for processing the engine data into a predetermined format;

one or more instructions for building an engine baseline model from the preprocessed data, wherein the engine baseline model relates engine performance variables as a function of engine operating conditions;

one or more instructions for evaluating performance of the engine baseline model, wherein evaluating the performance of the engine baseline model comprises:

one or more instructions for evaluating a subset of the engines used to create the model in time order against the generated baseline;

one or more instructions for generating time-varying system trends;

one or more instructions for plotting data points representative of the time-varying system trends over time;

one or more instructions for fitting a smoothed curve to the plotted data points;

one or more instructions for computing residual errors for each point; and

one or more instructions for using the residual errors to evaluate the performance of the engine baseline model, wherein the engine baseline model is used to perform at least one of monitoring engine status, predicting future engine behavior, diagnosing engine faults, determining engine performance, determining engine quality and designing new engine systems.

22. The computer-readable medium of claim 21, wherein residual errors computed reflect the amount by which each trend point varies from the smoothed curve.

23. The computer-readable medium of claim 21, further comprising:

one or more instructions for estimating a sigma value by performing a root mean squared error calculation; and

one or more instructions for generating summary statistics using the estimated sigma values.

24. The computer-readable medium of claim 23, wherein a good model is best represented by lower estimated sigma values.

10. APPENDIX OF EVIDENCE

None

11. APPENDIX OF RELATED PROCEEDINGS

None.